

a hollow first conductive member, including a first end having a first conductive member first surface in contact with and electrically coupled to the first circuit board first conductive surface, a second end distal from the first end having a first conductive member second surface in contact with and electrically coupled to the second circuit board first surface and a compressible section urging said contact; and

Ant'd
C1 a second conductive member, disposed within the first conductive member and mechanically coupling the first circuit board and the second circuit board such that the two circuit boards are separated by a rigid portion of the second conductive member, the second conductive member having a second conductive member first surface electrically coupled to the first circuit board second surface and a second conductive member second surface distal from the second conductive member first surface electrically coupled to the second circuit board second conductive surface.

4. (Amended) The apparatus of claim 2, wherein the first conductive member and C2 the second conductive member have matching cross sectional shapes selected from group comprising:

circular;
ovoid; and
rectangular.

7. (Amended) the apparatus of claim 1, wherein:

C3 the second conductive member is rigid mechanical standoff member mechanically coupling the first circuit board and the second circuit board, and is disposable between the first circuit board first conductive surface and the second circuit board first conductive surface such that the first circuit board and the second circuit board are separated by a standoff distance.

11. (Amended) The apparatus of claim 1, wherein the compressible section is a crushable washer.

13. (Amended) The apparatus of claim 1, wherein the compressible section is a spring portion.

14. (Amended) The apparatus of claim 13, wherein the spring portion is disposed at the first end and compressibly contacts the first circuit board first conductive surface.

Appl. No. : 09/801,437
Filed : March 8, 2001

Cont'd
C3

15. (Amended) The apparatus of claim 13, wherein the spring portion is disposed at the second end and compressibly contacts the second circuit board first conductive surface.

[Please add the following new Claims 35-38 as follows:]

35. (New) A printed circuit board assembly comprising:

a first circuit board having a first circuit board first conductive surface and a first circuit board second conductive surface;

a second circuit board having a second circuit board first conductive surface and a second circuit board second conductive surface;

a hollow first conductive member, including a first end in contact with and electrically coupled to the first circuit board first conductive surface, a second end distal from the first end in contact with and electrically coupled to the second circuit board first surface and a compressible section urging said contact; and

a second conductive member, disposed within the first conductive member and mechanically coupling the first circuit board and the second circuit board such that the two circuit boards are separated by a standoff distance, the second conductive member having a second conductive member first surface electrically coupled to the first circuit board second surface and a second conductive member second surface distal from the second conductive member first surface electrically coupled to the second circuit board second conductive surface.

36. (New) A printed circuit board assembly comprising:

a first circuit board having a first circuit board first conductive surface and a first circuit board second conductive surface;

a second circuit board having a second circuit board first conductive surface and a second circuit board second conductive surface;

a first conductive member, including a first end in contact with and electrically coupled to the first circuit board first conductive surface, a second end distal from the first end in contact with and electrically coupled to the second circuit board first surface and a compressible section urging said contact; and

a hollow second conductive member, with the first conductive member disposed within and mechanically coupling the first circuit board and the second circuit board such that

C4

Appl. No. : 09/801,437
Filed : March 8, 2001

the two circuit boards are separated by a standoff distance, the second conductive member having a second conductive member first surface electrically coupled to the first circuit board second surface and a second conductive member second surface distal from the second conductive member first surface electrically coupled to the second circuit board second conductive surface.

37. (New) A power feed standoff assembly for mechanically coupling a first circuit board with a through hole to a second circuit board with a through hole and for providing a ground path and a power path between the two circuit boards, the power feed standoff assembly comprising:

a hollow first conductive member, including a first end having an electrical contact surface, a second end distal from the first end and having an electrical contact surface and a compressible section providing force in a longitudinal direction of the first conductive member when compressed: and

C4 a second conductive member disposed coaxially within the first conductive member and having

a mechanical connector portion configured to extend into a through hole in a circuit board,

a rigid standoff section extending in the longitudinal direction from the mechanical connector portion and having a shelf portion which exceeds a diameter of the through hole and a contact surface distal from the shelf portion with the contact surface not extending beyond the electrical contact surface of the second end of the first conductive member.

38. (New) A power feed standoff assembly for mechanically coupling a first circuit board with a through hole to a second circuit board with a through hole and for providing a ground path and a power path between the two circuit boards, the power feed standoff assembly comprising:

a first conductive member, including a first end having an electrical contact surface, a second end distal from the first end and having an electrical contact surface and a compressible section providing force in a longitudinal direction of the first conductive member when compressed: and

a hollow second conductive member, with the first conductive member disposed coaxially within the second conductive member, the second conductive member having

Appl. No. : 09/801,437
Filed : March 8, 2001

a mechanical connector portion configured to extend through a through hole in a circuit board,

*Contd
C4*
a rigid standoff section extending in the longitudinal direction from the mechanical connector portion and having a shelf portion which exceeds a diameter of the through hole and a contact surface distal from the shelf portion with the contact surface not extending beyond the electrical contact surface of the second end of the first conductive member.

In the Specification

Please amend the Specification as follows:

Please replace the paragraph beginning at page 12, line 19, with the following rewritten paragraph:

C5
In the illustrated embodiment, both the first conductive member 303 and the second conductive member 301 are cylindrical in shape (e.g. generally circular in cross section), but this need not be the case. Although the circular cross section depicted is preferred, the first and second conductive members 303, 301 may be of an ovoid, rectangular, or trapezoidal cross section. Or, the conductive members 303, 301 may simply be a pair of adjacent linear conductive members having an insulator or insulating space therebetween. In each case, the longitudinal axes of symmetry for the first and second conductive members 303, 301 can be made substantially co-linear.

Please replace the paragraph beginning at page 12, line 27, with the following rewritten paragraph:

C6
The first conductive member 303 is also disposed through a plated through hole (PTH) in the first circuit board 306. The first conductive member 303 can be affixed to the first circuit board 306 by a swage 312. The swage 312 works cooperatively with the shoulder portion 316 to affix the first conductive member 303 to the first circuit board 306.

Appl. No. : 09/801,437
Filed : March 8, 2001

Please replace the paragraph beginning at page 13, line 1, with the following rewritten paragraph:

C7 The first conductive member 303 can be further attached to the first circuit board 306 by a soldering. However, soldering alone is not the preferred method of affixing the first conductive member 303 to the first circuit board 306.

[Please replace the paragraph beginning at page 13, line 4, with the following rewritten paragraph:]

C8 The plated through hole 322 and the surrounding first circuit board first surface 307 together with the first conductive member 303 define an inner coaxial power circuit. In one embodiment, the inner coaxial power circuit is completed by a conductive fastening device 305 such as a screw, which makes electrical contact with the first conductive member 303 and the second circuit board first surface 310, thus forming an electrically conductive path from the first circuit board 306 to the second circuit board 309. In one embodiment, the first conductive member 303 includes hollow portion having a threaded inner surface configured to accept and hold. Also, the height of the first conductive member 303 is typically slightly less than the height of the second conductive member 301 for the reasons described below.

[Please replace the paragraph beginning at page 13, line 14, with the following rewritten paragraph:]

C9 The second conductive member 301 forms the outer coaxial circuit engaging the first circuit board second surface 308 (which may include a power pad pattern) and the second circuit board second surface 311. In one embodiment, dielectric 302 does not grip the first conductive member 303 and the second conductive member 301 so tightly that their relative position can not be adjusted slightly with a force imparted by fastener 305 such that the upper surface 313 of first conductor 303 can come into intimate contact with the first circuit board

cont'd
C9

second surface 308, thus completing the upper half of the outer coaxial power circuit.

Please replace the paragraph beginning at page 13, line 22, with the following rewritten paragraph:

C10

Because the first conductor 303 is slightly shorter than second conductor 301 both circuit feeds have identical and predictable joining forces between PCB 306 and PCB 309. Such would not be the case if the two conductors 303, 301 were of approximately equal length where slight variations in length may cause an unpredictable shift in forces between the two conductors as they press against the surfaces of PCB 306 and 309. Further, the fact that the first conductive member 303 and the second conductive member 301 are coaxially arranged to reduce the unwanted electromagnetic fields that might be created from electric disturbances induced into the assembly 300.

Please replace the paragraph beginning at page 14, line 2, with the following rewritten paragraph:

C11

The power feed standoff assembly 300 may be produced by separately fabricating items 301, 302 and 303 and pressing them together forming an inseparable assembly. The power feed standoff assembly 300 may also be produced by separately fashioning the first conductive member 303 and the second conductive member 301, supporting the members 301, 303 in a fixture, and inserting a dielectric 302 into the gap separating 301 and 303 (e.g. under heat and pressure) and curing the dielectric material 302. It should be noted that second conductor 301, dielectric 302 and first conductor 303 can be separate parts that are assembled in a different sequence than is described above without detracting from the benefits of this invention.

Please replace the paragraph beginning at page 14, line 13, with the following rewritten paragraph:

C12

FIG. 4 is a two-dimensional sectional view of another embodiment of the power feed standoff assembly 300. This embodiment is similar to that which is depicted in FIG. 3, however, a compressible conductive member such as a crushable washer 401 is disposed between the second circuit board 309 first surface 310 and the first conductive member second surface 317. This provides a direct path by which current in the first conductive member 303 passes directly to the first conductive surface 310 on the second circuit board 309. Crushable washer 401 significantly reduces the inductance of the electrical interconnect because current does not have to proceed through the screw body to the second circuit board 309 first conductive surface 310 but rather can proceed directly from the base of first conductive member 303 to the second circuit board 309 first conductive surface 310. The crushable washer 401 still provides the benefits of providing predictable forces to both the first and second conductive members 303 and 301 respectively. It is also noted that the compressible range of crushable washer 401 need not be excessive, since acceptable tolerances are limited principally to the height variations between first conductive member 303 and second conductive member 301 which is typically less than 2 mils.

Please replace the paragraph beginning at page 14, line 29, with the following rewritten paragraph:

C13

FIG. 5 is a two-dimensional section view of another embodiment of the power feed standoff assembly 300, illustrating still another structure for eliminating the passage of current through the screw 305. Unlike the embodiment FIG. 4 where the compliant member was the crushable washer 401 located so as to be in electrical contact with the first conductive member 303, in this embodiment, the second conductive member 303 is fabricated with a compressibly compliant section 501 which acts as a spring. In this arrangement, first conductive member conductor 303 is the "fixed" height member and second conductive member 301 is the slightly longer member with a compressibly compliant end section 501 that takes up variations in height between first

contd
C13

conductive member 303 and the second conductive member 301, providing a direct path for both the first and second conductor members 303 and 301 to the second circuit board first conductive surface 310 and the second circuit board second conductive surface 311, respectively.

Please replace the paragraph beginning at page 15, line 17, with the following rewritten paragraph:

CM

FIG. 7A is a diagram illustrating another embodiment of the power feed standoff assembly 300. In this embodiment, a spring contact assembly 702 is used to electrically connect lower half (i.e. the second ends) of the first conductive member 303 and the second conductive member 301 to the second circuit board 309. In the illustrated embodiment, the spring contact assembly 702 includes a plurality of cantilever beam spring elements 703 and 704.

Please replace the paragraph beginning at page 17, line 5, with the following rewritten paragraph:

C15

FIG. 8B is a plan view of the power feed standoff assembly 300 illustrated in FIG. 8A looking into the concentric blade assemblies 801 and 802. In order to ease the assembly of blade assemblies 801 and 802 to first and/or the second circuit boards 306, 309, blade assemblies 801 and 802 can be joined together with an insulative plastic resin 803, thus forming the integrated blade assembly 806. Although not shown, this assembly may have vertical protrusion features that are a part of 801, 802 or 803 which engage into mating holes in PCBs 306 and 309 to facilitate alignment and assembly.

Please replace the paragraph beginning at page 17, line 15, with the following rewritten paragraph:

C16

FIG. 8C is a plan view looking into the top or bottom of the first and second conductive members 303 and 301 illustrating how the female portion 804 can be segmented.

Appl. No. : 09/801,437
Filed : March 8, 2001

Please replace the paragraph beginning at page 20, line 19, with the following rewritten paragraph:

C17
FIG. 11A and 11B illustrate such an electromagnetic interference (EMI) frame 1101 incorporating power coupling devices therein. The EMI frame 1101 is used to contain undesirable electromagnetic fields from radiating to an external environment. Here the power standoff assembly 300 can either be a separate assembly that is passed into the frame 1101 or the frame 1101 may become a part of the power standoff assembly's second conductor 301 with the first conductor cylinder 303 and the dielectric 302 similar to what has been described in the referenced related patent disclosures. In one embodiment, the second conductor 301 protrudes slightly higher than the base of the frame 1101 so as to insure that electrical contact is made at the outer cylinder 301 and not at some general feature of the frame. In this way the integrity of the coaxial current paths are maintained. Note also that in the interest of clarity, FIG. 11A does not show EMI gasketing materials between the frame and PCB 306 and PCB 309.

REMARKS

After entry of the foregoing amendments Claims 1, 2, 4-7, 11, 13-15 and 35-38 are pending in the application and are presented for reconsideration and further examination in view of the foregoing amendments and the following remarks. By the foregoing amendments Claims 3, 8, 9, 10, 12 and 16-34 have been cancelled without prejudice or disclaimer, Claims 1, 4, 7, 11, 13, 14 and 15 have been amended and new Claims 35-38 have been added.

Priority

In the Office Action reference was made to receipt of a certified copy of a Japanese application. This application does not claim priority to any Japanese application.

Objections to the Drawings

In the Office Action the figures were objected to as having improper cross-hatching in addition the drawings were objected to in connection with the usage of various reference characters.

Submitted herewith are corrected drawings with proper cross-hatching. Also submitted herewith are marked up copies of the drawings showing the corrections, where possible, in red.